CLAIMS

What is claimed is:

1. A sensor for detecting acoustic energy, comprising:

a microstructure having a natural resonant acoustic frequency, said microstructure having first and second layers being formed from first and second materials respectively, said first material having a physical response in reaction to at least one form of energy other than acoustic energy that is different from a physical response of said second material in reaction to said at least one form of energy other than acoustic energy;

wherein exposing said microstructure to said at least one form of energy other than acoustic energy causes said first and second layers to respond differently physically, creating physical stresses within said microstructure that change the resonant acoustic frequency of said microstructure from said natural resonant acoustic frequency to a predetermined resonant acoustic frequency;

means for detecting movement of said microstructure;

means for tuning said microstructure; and

a display device operatively linked to said detecting means, whereby when acoustic energy strikes said sensor, acoustic energy having said predetermined moves said microstructure, which said movement is detected by said detecting means.

2. The sensor of claim 1, wherein said means for tuning said microstructure transmits energy other than acoustic energy on to said microstructure for changing a natural acoustic resonant frequency of said microstructure.

3. The sensor of claim 2, wherein said energy other than acoustic energy is at least one of light energy, thermal energy, and energy derived from an electric field.

4. The sensor of claim 1, wherein said means for tuning said microstructure dampens said microstructure such that a natural acoustic resonant frequency of said microstructure is altered.

5. A sensor for detecting acoustic energy, comprising:

a microstructure having a natural resonant acoustic frequency, said microstructure having first and second layers being formed from first and second materials respectively, said first material having a physical response in reaction to at least one form of energy other than acoustic energy that is different from a physical response of said second material in reaction to said at least one form of energy other than acoustic energy;

wherein exposing said microstructure to said at least one form of energy other than acoustic energy causes said first and second layers to respond differently physically, creating physical stresses within said microstructure that change the resonant acoustic frequency of said microstructure from said natural resonant acoustic frequency to a predetermined resonant acoustic frequency;

means for detecting movement of said microstructure;

means for tuning said microstructure; and

a display device operatively linked to said detecting means, whereby when acoustic energy strikes said sensor, acoustic energy having said predetermined moves said microstructure, which said movement is detected by said detecting means.

6. The sensor of claim 5, wherein said detecting means includes a light source for directing a beam of light on said microstructure and a light detector for receiving light reflected off of said microstructure produced by said light source.

7. The sensor of claim 5, wherein said detecting means includes a capacitive sensing device.

8. The sensor of claim 5, wherein said microstructure includes piezoresistive material, said detecting means measures a change of resistance across said microstructure.

9. The sensor of claim 5, wherein said detecting means monitors a change of resonance of said microstructure.

10. A sensor for detecting acoustic energy, comprising:

a microstructure array;

said microstructure array comprising individual microstructures each having a natural resonant acoustic frequency, each said microstructure having first and second layers being formed from first and second materials respectively, said first material having a physical response in reaction to at least one form of energy other than acoustic energy that is different from a physical response of said second material in reaction to said at least one form of energy other than acoustic energy;

wherein exposing said microstructures to said at least one form of energy other than acoustic energy causes said first and second layers to respond differently physically, creating physical stresses within said microstructures that change the resonant acoustic frequency of at least one of said microstructures from its natural resonant acoustic frequency to a resonant acoustic frequency lying within a predetermined frequency range;

whereby said microstructure array is tuned for said predetermined frequency range;

means for detecting movement of individual microstructures in said microstructure array;

means for detuning neighboring microstructures away from a natural acoustic resonant frequency of a selected microstructure in said microstructure array; and

a display device operatively linked to said detecting means, whereby when acoustic energy strikes said sensor, acoustic energy falling within

said predetermined frequency range moves individual microstructures, which said movement is detected by said detecting means.

11. The sensor of claim 10, wherein said detuning means exposes said neighboring microstructures with energy other than acoustic energy.

12. The sensor of claim 11, wherein said energy other than acoustic energy is at least one of light energy, thermal energy, and energy derived from an electric field.

13. A sensor for detecting acoustic energy, comprising:

a microstructure array;

said microstructure array comprising individual microstructures each having a natural resonant acoustic frequency, each said microstructure having first and second layers being formed from first and second materials respectively, said first material having a physical response in reaction to at least one form of energy other than acoustic energy that is different from a physical response of said second material in reaction to said at least one form of energy other than acoustic energy;

means for dampening one or more of said microstructures such that a natural acoustic resonant frequency of said one or more microstructures is altered, whereby said microstructure array is tuned for said predetermined frequency range;

means for detecting movement of individual microstructures in said microstructure array; and

a display device operatively linked to said detecting means, whereby when acoustic energy strikes said sensor, acoustic energy falling within said predetermined frequency range moves individual microstructures, which said movement is detected by said detecting means.

14. A sensor for detecting acoustic energy, comprising:

a microstructure array;

said microstructure array comprising individual microstructures each having a natural resonant acoustic frequency, each said microstructure having first and second layers being formed from first and second materials respectively, said first material having a physical response in reaction to at least one form of energy other than acoustic energy that is different from a physical response of said second material in reaction to said at least one form of energy other than acoustic energy;

wherein exposing said microstructures to said at least one form of energy other than acoustic energy causes said first and second layers to respond differently physically, creating physical stresses within said microstructures that change the resonant acoustic frequency of at least one of said microstructures from its natural resonant acoustic frequency to a resonant acoustic frequency lying within a predetermined frequency range;

whereby said microstructure array is tuned for said predetermined frequency range;

means for detecting movement of individual microstructures in said microstructure array; and

a display device operatively linked to said detecting means, whereby when acoustic energy strikes said sensor, acoustic energy falling within said predetermined frequency range moves individual microstructures, which said movement is detected by said detecting means.

15. The sensor of claim 14, wherein said detecting means includes a light source for directing a beam of light on said microstructure and a light detector for receiving light reflected off of said microstructure produced by said light source.

16. The sensor of claim 14, wherein said detecting means includes a capacitive sensing device.

17. The sensor of claim 14, wherein each microstructure of said microstructure array includes piezoresistive material, and wherein said detecting means measures a change of voltage across said microstructure.

18. The sensor of claim 14, wherein said detecting means monitors a change of resonance of each microstructure in said microstructure array.

19. A method for detecting acoustic energy comprising the steps of:

providing a microstructure having a natural resonant acoustic frequency, said microstructure having first and second layers being formed from first and second materials respectively, said first material having a physical response in reaction to at least one form of energy other than acoustic energy that is different from a physical response of said second material in reaction to said at least one form of energy other than acoustic energy;

exposing said microstructure to said at least one form of energy other than acoustic energy so as to cause said first and second layers to respond differently physically, creating physical stresses within said microstructure that change the resonant acoustic frequency of said microstructure from said predetermined resonant acoustic frequency to a predetermined resonant acoustic frequency, whereby said microstructure is tuned to a predetermined acoustic frequency;

exposing said microstructure to acoustic energy;

detecting movement of said microstructure; and

activating a display device to indicate that said predetermined acoustic frequency has been detected.

20. The method of claim 19, wherein said at least one form of energy other than acoustic energy is at least one of light energy, thermal energy, and energy derived from an electric field.

21. The method of claim 19, wherein said detecting step comprises the steps of:

activating a laser device;

focusing light energy from said laser device onto said microstructure; and

detecting movement of said light energy with a light detector in accordance with movement of said microstructure.

22. The method of claim 19, wherein said detecting step comprises the step of detecting movement of said microstructure with a capacitance sensing device.

23. The method of claim 19, wherein said microstructure comprises piezoresistive material, and wherein said detecting step comprises the step of measuring a change of voltage across said microstructure.

24. The method of claim 19, wherein said detecting step comprises the step of detecting movement of said microstructure according to a change of resonance of said microstructure.

25. A method for detecting acoustic energy comprising the steps of:

providing a microstructure array, said microstructure array comprising individual microstructures each having a natural resonant acoustic frequency, each said microstructure having first and second layers being formed from first and second materials respectively, said first material having a physical response in reaction to at least one form of energy other than acoustic energy that is different from a physical response of said second material in reaction to said at least one form of energy other than acoustic energy;

dampening said microstructure such that a natural acoustic resonant frequency of said microstructure is altered;

whereby said microstructure array is tuned for said predetermined acoustic frequency range;

exposing said microstructure array to acoustic energy;

detecting movement of individual microstructures in said microstructure array; and

displaying detected acoustic frequencies on a display device.

26. A method for detecting acoustic energy comprising the steps of:

providing a microstructure array, said microstructure array comprising individual microstructures each having a natural resonant acoustic frequency, each said microstructure having first and second layers being formed from first and second materials respectively, said first material having a physical response in reaction to at least one form of energy other than acoustic energy that is different from a physical response of said second material in reaction to said at least one form of energy other than acoustic energy;

detuning neighboring microstructures away from a natural acoustic resonant frequency of said selected microstructure in said microstructure array;

exposing said microstructure array to acoustic energy;

detecting movement of individual microstructure in said microstructure array; and

displaying detected acoustic frequencies on a display device.

27. The method of claim 26, wherein the step of detuning comprises the step of exposing said neighboring microstructures with energy other than acoustic energy.

28. The method of claim 27, wherein said energy other than acoustic energy is at least one of light energy, thermal energy, and energy derived from an electric field.

29. The sensor of claim 26, wherein said detuning step comprises the step of dampening said microstructure such that a natural acoustic resonant frequency of said microstructure is altered.

30. The method of claim 26, wherein said detecting step further comprises the steps of:

activating a laser device;

focusing light energy from said laser device onto an individual microstructure; and

detecting movement of said light energy with a light detector in accordance with movement of said individual microstructure.

31. The method of claim 26, wherein said detecting step further comprises the steps of detecting movement of each microstructure with a capacitance sensing device.

32. The method of claim 26, wherein each microstructure comprises piezoresistive material, and wherein said detecting step comprises the step of measuring a change of resistance across each microstructure.

33. The method of claim 30, wherein said detecting step comprises the step of detecting movement of each microstructure according to a change of resonance of a respective microstructure.